DOCUMENT RESUME

ED 136 511 EC 100 026

AUTHOR Proger, Barton B.
TITLE Curriculum Management Systems and Objectives Banking Efforts in Pennsylvania.
PUB DATE [76]
NOTE 16p.; Paper presented at the Conference on Curriculum, Objectives, and Measurement sponsored by the Office of Los Angeles County Superintendent of Schools (Los Angeles, California, February 28 to March 2, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Conceptual Schemes; *Curriculum Problems; *Educational Objectives; Elementary Secondary Education; Exceptional Child Education; *Handicapped Children; *Management Systems; Models; *Systems Approach
IDENTIFIERS Pennsylvania; *SER LARS

ABSTRACT

Described is the Special Education Resources Location Analysis and Retrieval System (SER-LARS), a curriculum management system for several areas of exceptionality developed by the National Learning Resource Center of Pennsylvania; and briefly viewed are other curriculum management system efforts in Pennsylvania. Problems of building objectives banks are explored. The author notes that a curriculum-free management system (such as SER-LARS) appears to suffer from fatal flaws at this point of technological development, and that the curriculum-embedded model is the only system seen to be effective at this time. (IM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED136511

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CURRICULUM MANAGEMENT SYSTEMS AND OBJECTIVES BANKING EFFORTS IN PENNSYLVANIA[1]

Barton B. Proger
Montgomery County Intermediate Unit No. 23
Norristown, Pennsylvania

From about 1969 to the present time, Montgomery County Intermediate Unit has been addressing the problems of how to adapt various technological developments to handicapped children. In particular, the Intermediate Unit's Division of Special Education (and several federal projects operated by it) have done extensive work in building curriculum management systems for several areas of exceptionality: learning disabled, educable mentally retarded, trainable mentally retarded, and the severely/profoundly retarded (Olsen, Carricato, &CCSU, 1975; Proger & Mann, 1973; Proger, Mann, Burger, & Cross, 1972; Burger, Mann, & Associates, 1975; Doyle, Mann, & Associates, 1976). Basically, each curriculum management system that has been devised contains an appropriate set of behavioral objectives, curriculum materials, and a criterion-referenced measurement system.

The present paper describes the rather massive curriculum management system that was developed by the National Learning Resource Center of Pennsylvania (NLRC/P) over the course of about five years: Special Education Resources Location Analysis & Retrieval System (SER-LARS; Olsen, Carricato, &CCSU, 1975). Apart from SER-LARS, this paper also will touch briefly on other curriculum management system efforts in Pennsylvania: Individual Achievement Monitoring System (IAMS), Training for Independence (TFI), and Training Resources Acquisition and Control (TRAC) Monitoring System. All of the above systems were developed on federally supported projects operated by the Montgomery County Intermediate Unit No. 23's Division of Special Education. In addition to these systems, a few miscellaneous objectives banking efforts in Pennsylvania will also be described.

EC100026

SPECIAL EDUCATION RESOURCES LOCATION ANALYSIS & RETRIEVAL (SER-LARS)

The most recent edition of SER-LARS (Olsen, Carricato, & CCSU, 1975) consists of several volumes that cover the components of learning objectives, tests, learning environments, instructional materials, instructional methods, human resources, and students. SER-LARS was designed around a standard diagnostic-prescriptive model (Olsen, 1973) that contains seven levels: (1) describe student, (2) pretest skills levels, (3) diagnose content deficits, (4) diagnose process and learning style problems, (5) identify learning objectives and administer objectives-referenced measures, (6) write instructional prescription, (7) implement and monitor the prescription, and (8) posttest skills levels. All of the components in SER-LARS were continuously in the process of being updated by means of field data input on machine-readable coding sheets for storage by computer. This information was generated in five different settings: NLRC/P Urban Unit, NLRC/P Suburban Unit, NLRC/P Rural Unit, NLRC/P Western Unit, and NLRC/P Middle Urban Unit. Thus, the system had statewide field testing.

The results of the NLRC/P objectives banking efforts are reflected in two different sets of volumes. First, one begins by examining "Objectives by Content Area" (Olsen, Carricato, &CCSU, 1975). This 576-page volume contains complete statements of objectives grouped into twelve areas: (1) sensory/perceptual/ cognitive, (2) affective, (3) reading, (4) language arts and usage, (5) mathematics, (6) social studies, (7) science, (8) coordination and physical education, (9) self-care, (10) prevocational and vocational, (11) fine arts and music, and (12) self-knowledge and social interaction. Each of these areas is further subdivided (e.g., reading has the subcategories of readiness, phonics, comprehension, structural analysis, vocabulary, oral reading, literature, and programs). The volume describes in detail each of the subcategories and then proceeds to list the detailed objectives. The edited objectives have been derived from sources

such as IOX, The Individual Achievement Monitoring System, COMPET, Idaho TMR Skills Assessment, Summer Traineeship Programs operated by the Pennsylvania Bureau of Special and Compensatory Education, and CRTR. It is estimated that this volume contains 4600 objectives.

After one locates the objectives of interest as above, he can then look up the usage records of those objectives in one of the three columes of the "Objective History" (Olsen, Carricato, & CCSU, 1975). This record was empirically generated from the several field units of NLRC/P and lists for each objective the materials used, the number of times used, the effectiveness rating (1 to 4), chronological age of students, and mental age of students. As an indication of the extensiveness of these records, Volume I contains 500 pages, Volume II 500 pages, and Volume III 517 pages. However, the almost uncountable number of combinations among student characteristics, materials, and objectives makes this portion of the overall curriculum management system very limited in utility.

The next component of SER-LARS deals with "Objective Referenced Measures" (Olsen, Carricato, & CCSU, 1975). The 286-page volume contains tests either commercially available or specially devised to measure objectives already in SER-LARS. However, this volume covers only 219 of the approximately 4600 objectives listed in the volume on "Objectives by Content Area." Thus, its original purpose of providing the user with measures that are linked to quite specific objectives in SER-LARS is limited. For most of the measures listed, four major types of information are provided in varying degrees of completeness: background and source, directions for administering, description test/task and/or sample items, and directions for scoring. Apart from project-constructed measures, sources of the measures include Heath Elementary Math Series by Dilley et al., Addison-Wesley Elementary School Math Series by Eicholz, McGraw-Hill's Dr. Spello by Kottmeyer, the Boehm Test of Basic Concepts, SRA's Diagnosis: An Instructional Aid (Reading), Individual Reading Curriculu by Broska et al., Kenworthy Educational

Services Traditional Diagnostic Arithmetic Test, Reader's Digest Services' Prescriptive Evaluation Chart, R. Zweig Associates' Fountain Valley materials, Key Math Test, and so on.

A major component of SER-LARS is the large bank of "Instructional Methods" (Olsen, Carricato, & CCSU), which deals with the techniques of instruction. Each technique is catalogued by means of a unique accession number and is described in terms of source and background identification information, content area descriptors, editorial comments of NLRC's CCSU, sequential student tasks, implementer actions, and media/materials. The user will most probably access the techniques by initially scanning the index of content area descriptors (identical to those used in the volume on "Objectives by Content Area"), which is cross-referenced with the accession numbers for instructional methods. For example, the SER-LARS user might go to the section of the index dealing with "Reading," look under "Phonics," and finally settle upon "Blend/Initial." The accession numbers associated with this area are then given. There are three volumes for "Instructional Methods": Volume I contains about 650 methods, Volume II about 600 methods, and Volume III about 300 methods.

The final major component of SER-LARS comprises a five-volume set of instructional materials (Mitchell, Olsen, & CCSU, 1974). Two volumes contain "Instructional Materials by Number." One volume contains "Instructional Materials by Publisher." One volume contains "Instructional Materials: Teacher-Made and Commercially Adapted." As an indication of how extensive the commercial materials listings are, the "Instructional Materials by Title" volume contains 543 pages, or an estimated total of 5900 materials. The two volumes on "Instructional Materials by Number" can be used in conjunction with the three-volume "Objective History" to identify materials in the latter series that have been field-tested in various settings. The volumes on "Instructional Materials by Publisher" and "Instructional Materials by Title" are useful primarily for general inventory purposes and for completing NLRC computer coding forms that document the instructional prescriptions used with the children.

In summary, SER-LARS represents a monumental effort on the part of NLRC to facilitate applied practice and research with the diagnostic-prescriptive model. Years of development, field testing, and refinement have gone into SER-LARS. It would seem to be the most comprehensive curriculum management system currently available, although it is not without its problems. As one can gather from the above description, SER-LARS consists of several "telephone directories" that the user must wade through in order to coordinate all the various components --assuming SER-LARS is to be used as a complete entity. On the other hand, if the future user of SER-LARS is interested only in one or two components of the total SER-LARS array (e.g., "Objectives by Content Area"), then the system becomes a valuable reference material. Further development of SER-LARS by NLRC has been halted for the time being, and the system will be available from the ERIC Clearinghouse on Exceptional Children for those who wish to obtain the entire set of volumes, or selected portions, in an economical fashion.

PALO ALTO CURRICULUM MANAGEMENT SYSTEM (CMS)

Apart from the SER-LARS efforts by Olsen and associates in CCSU of NLRC, the Suburban Unit of NLRC developed a curriculum-embedded curriculum management system for use with the already existing Palo Alto Reading Program by Glim (Proger & Mann, 1973). The Palo Alto Curriculum Management System (CMS) has been used extensively with much success with learning disabled children and the educable mentally retarded. The CMS consists of detailed objectives and monitors (or progress tests to be used in criterion-referenced-measurement fashion). The revised Palo Alto Reading Program consists of 21 books. For each book, there are CMS pretests and posttests.

While SER-LARS represents probably the most ambitious curriculum-free system to date, the Palo Alto CMS on the other hand represents the more easily developed and usable curriculum-embedded variety of curriculum management system.

COMPET CURRICULUM MANAGEMENT SYSTEM

COMPET (Commonwealth Plan to Educate and Train Mentally Retarded Children; Right to Education Office, 1972) was devised as part of Pennsylvania's total plan to guarantee the right to a free public education for the retarded. While it must be remembered that the Commonwealth's response to the Amended Consent Agreement involved several other aspects, this paper has focused upon the COMPET document because of the inherent emphases upon objectives-based instruction and continuous measurement. Thus, COMPET becomes in and of itself a valuable resource to instruction. COMPET contains twenty areas of objectives: gross motor development, fine motor development, visual motor training, auditory, tactile/kinesthetic, self-concept, communication, conceptual, math, toileting, feeding/eating/drinking, grooming, oral hygiene, nasal hygiene, clothing care, personal safety, self-help and independence, social interaction, pre-vocational, and vocational. Each of the twenty areas is then broken up into primary objectives (e.g., under gross motor development, "to establish, refine, and maintain skills pertaining to the meaningful use of the head, torso, and extremities"), behavioral prerequisites ("muscular and neurological potential for movement of head, torso, and extremities"), specific staff skills required, recommended behavioral objectives (e.g., "demonstrates the ability to raise head in a coordinated manner independently" which itself is broken into five enabling objectives, one of which is "turns head in response to a sound while lying down"), possible general methods and materials (e.g., "use food or social reinforcement to encourage the student to raise his head"), specific commercial materials, and references for further reading. While the plan was put forth as an initial attempt at mapping out the objectives suitable for the mentally retarded, it should be noted that no specific measurement system per se was embodied.

TRAINING FOR INDEPENDENCE

A curriculum management system that involves tasks somewhat similar to COMPET is Training for Independence (TFI), which was designed for trainable mentally retarded children. The TFI system

includes objectives, specific instructional steps and task analyses, and a CRM framework for recording progress of children.

TFI includes seven spiral-bound volumes that lend themselves easily to classroom reference use on the lap of the teacher who will be working side-by-side with a trainable retarded child. Each volume embodies a criterion-referenced measurement approach (CRM) to recording and interpreting. The broad topics of each volume (Volume I, Underwear and Footwear; Volume II, Indoor and Outdoor Clothing; Volume III, Fastenings; Volume IV, Grooming and Self-Care Skills; Volume V, Parent Manual; Volume VI, Academics; Volume VII, Prevocational/Home Skills) are broken down into several task-analyzed skill areas. For each skill area, there are screening tests of entry-level skills, as well as criterion pretest and posttest measures (scored only as pass-fail). The CRM system includes retention testing and transfer testing (switching the task from school to home setting).

Volume I covers Underwear and Footwear (Mann, Burger, Buckley, & Hickade, 1975). Volume II covers Indoor and Outdoor Clothing (Buckley, Burger, Hickade, & Mann, 1975). The Indoor portion includes Belts, Bow Ties, Clip-On Ties, Dresses, Shirts/Blouses, Shorts, Skirts, and Trousers/Pants/Slacks. The Outdoor portion includes Coats/Jackets/Cardigans, Gloves, Hats/Caps, Headscarf, Mittens, and Muffler/Scarf. Volume III covers Fastenings (Buckley, Burger, Hickade, & Mann, 1975). Volume IV covers Grooming and Self-Care Skills (Burger, Buckley, Mann, & Baird, 1975). Volume V consists of a Parent Manual (Buckley, Burger, Mann, & Schiffman, 1975). This volume takes the parent through the same topics as Volumes I through IV. Volume VI deals with Academics (Diamond, Matilsky, Burger, Mann, Rintamaki, Weiner, Buckley, & Baird, 1976). The major areas covered are Preacademic Skills (e.g., Responding to Name), Fundamental Skills (e.g., Matching), Language Arts (e.g., Pronouns), Number Work (e.g., Matching Numerals to Corresponding Objects), and Handwriting (e.g., Tracing Letters). Volume VII covers Prevocational/ Home Skills (Coombe, Burger, Mann, Rintamaki, Diamond, Schiffman, Matilsky, Weiner, & Biacchi, 1976). Concept areas treated in this volume include Safety Factors

(e.g., Sharpened Tools), Bedmaking (e.g., Putting on a Fitted Sheet), Cleaning (e.g., Polishing), Food Preparation/Cooking (e.g., Chopping with Wide-Bladed Knife), Laundering (e.g., Rinsing in Filled Basin), Sewing (e.g., Sewing on a Button), and Maintenance (e.g., Pruning).

COMPUTER-BASED OBJECTIVES IN SPECIAL EDUCATION

Intermediate Unit 16 has developed over several years a system of computerized prescriptions for handicapped children. This system has become of particular interest to those educators who are now attempting to meet the mandate of IEPs (Individual Educational Programs) under P.L. 94-142. Concise, accurate, and appropriate statements of objectives are the essence of this system. Here is an objectives-banking operation that has attempted to take advantage of current technology to further its conceptual goals.

IMPLICIT ASSUMPTIONS OF OBJECTIVES-BANKING EFFORTS: THE IMPOSSIBLE-DREAM SYNDROME

The reviewer has examined some of the pioneer efforts in objectives banking and related curriculum management system construction that have occurred in Pennsylvania. With regard to such concepts applied to the special education domains, Pennsylvania has been one of the leaders. The reviewer has often reflected upon the fervor of such efforts and where they have been (and will be) taking special educators. It is profitable in this regard to consider not only the Pennsylvania efforts but also national systems that have had even more impact (e.g., Instructional Objectives Exchange, the University of Massachusetts CO-OP objectives and test items, the New York State Department of Education at Albany, Fountain Valley Teacher Support Systems in Reading). And, of course, the public is now well aware of "customized" systems of objectives and test items available through major textbook/test publishers (e.g., SCORE of Westinghouse Learning

Corporation, Skills Monitoring System in Reading by Harcourt, Brace, Jovanovich; Instructional Pupil Monitoring System of Houghton-Mifflin; Individualized Criterion-Referenced Testing by Educational Development Corporation).

What are the driving forces behind these efforts? Why do educators (both regular and special) subject themselves to all this agony? A few reflections seem appropriate here. First, there appears to be the effect of a backwash from the initial powerful wave of behavioral objectives being forced upon everyone. Educators will never forget those traumatic days many years ago when they were first led to believe that their informal ways of planning lessons were no longer adequate. Never very comfortable with the notion of objectives, perhaps feelings of guilt and inadequacy continue to propel both curriculum developers and teachers into this self-inflicted situation. Second, there is a general feeling that "educational technology" now exists and that any embodiment of this should be bottled and sold wherever possible for the good of mankind. However, these are very general forces, and perhaps not even the major ones that have been at work. Third, and much more to the point, there is a desire on the part of curriculum and measurement experts to task analyze the instructional process in any content area into its component parts and to logically arrange (and rearrange) them into various hierarchies. As one who has suffered from such a desire, the reviewer would like to confess some of his feelings in this area.

When we first became interested in objectives and curriculum management systems in the late 1960's, (the National Learning Resource Center of Pennsylvania, or what at that time was the National Regional Resources Center of Pennsylvania) there were two major routes open: curriculum-free and curriculum-embedded. There were decisions to be made as to which route would be (a) easiest, (b) most appropriate instructionally, (c) most economical, and (d) most logistically feasible. Not knowing the answers to any of these questions, and not getting much satisfaction from others who had been in the same area of activity, we did the only

logical thing: blundered ahead on impossible dreams. As one can see, however, these dreams were not entirely consistent. On the one hand, one group within the project produced the monumental, comprehensive SER-LARS (an example of a curriculum-free system, such as IOX), while another group produced the Palo Alto Curriculum Management System (an example of a curriculum-embedded system). The point of this rambling confession will be to demonstrate in an unconvincing fashion the relative wisdom and folly of curriculum-free and curriculum-embedded systems, an issue which this reviewer considers to be the major one in objectives-banking efforts.

Everyone in the project began with the dream of the totally flexible, all-things-to-all-people (ATTAP)[2] model of the curriculum-free set of objectives and test items. The idea was to have a basic "shoe-box" full of both objectives and corresponding test items that could be rearranged, pruned, and added to so as to map the specific curricular hierarchy of any commercially available series, such as in reading or mathematics. However, the ambitiousness of this effort soon became apparent (although I personally still believe the dream could come true) and we temporarily put aside our curriculum-free efforts, although we had gone quite some distance in that direction. Instead, we settled for mapping in a curriculum-embedded manner a commercially available series which we felt would be adequately structured for learning disabled students (Palo Alto Reading Program).

A curriculum-embedded approach certainly is logistically feasible and can be highly effective once completed. The customized CRM systems currently available from publishers have capitalized upon this fact, although in the latter regard I have been able to take time and try to gather consumer usage feedback on these systems (something the Mental Measurements Yearbooks might seriously consider).

Returning to my favorite dream of the completely flexible, curriculum-free instructional management system of objectives and CRM, I have to temper my still optimistic stance by the

limited success of others who went heavily into this area. The IOX tests and objectives in reading and mathematics represent one of the most active endeavors in this domain of instructional management. While the IOX materials purport to be suitable for both instructional management and program evaluation, I find only the latter purpose is really adequately met; day-to-day decision-making (to me, the true nature of an instructional management syste) cannot be made on the basis of IOX materials because even their most specific level of objective covers in most series several weeks of instruction. Similarly, our own SWR-LARS curriculum-free system suffers from fatal flaws, such as sheer unwieldiness. I could go on in much more detail, but I think the point has been made that while we would all like to think the several available curriculum management systems are a definite step forward, I can only say at this point of technological development that the curriculum-embedded model is the only one that I have truely seen to be effective.

FUTURE TRENDS IN CURRICULUM MANAGEMENT SYSTEMS

Thus far in this paper we have addressed the problems of building objectives banks and their logical extension of curriculum management systems. No one will argue that it is physically possible to build variations of either the curriculum-free or the curriculum-embedded models (how effective they are in actual practice is quite another issue). Recently my colleagues and I had the pleasure of discussing with Jason Millman the issues of necessary and sufficient conditions with regard to hierarchies of instructional objectives. Validation schemes for objectives hierarchies have been put forth in the past (e.g., Airasian & Bart, 1975; White, 1973). As part of the task of constructing sound management systems, it would seem time to halt work on the mechanical creation of such systems and to address the more crucial problems of what competency levels on various early objectives are necessary to successful performance on later objectives in the hierarchy. It would be of value to simply do an ex post facto study of the effect of varying

levels of competency on early objectives in relation to performance on later objectives. This type of research could be done across various exceptionality groups. The data would be gotten after monitoring the total hierarchy of objectives for the course of an entire school year. In effect, the data would be analyzed by grouping and regrouping on a retrospective basis.

FOOTNOTES

[1]This paper was prepared for the Conference on Curriculum, Objectives, and Measurement sponsored by the Office of the Los Angeles County Superintendent of Schools, February 28, March 1, and March 2, 1977.

[2]I am indebted to Dr. Ronald Fischman of the Psychological Services Division of Montgomery County Intermediate Unit for lending me the use of the acronym already applied to the ombudsman psychologist in his employ.

REFERENCES

Airasian, Peter W., & Bart, William M. Validating A Priori Instructional Hierarchies. Journal of Educational Measurement, 1975, 12, 163-173.

Buckley, Sheila M., Burger, Robert M., Hickade, Marian L., & Mann, Lester. Training for Independence, Volume II, Indoor and Outdoor Clothing. Norristown, Pa.: Montgomery County Intermediate Unit, 1975.

Buckley, Sheila M., Burger, Robert M., Hickade, Marian L., & Mann, Lester. Training for Independence, Volume III, Fastenings. Norristown, Pa.: Montgomery County Intermediate Unit, 1975.

Buckley, Sheila M., Burger, Robert M., Mann, Lester, & Schiffman, Sedra. Training for Independence, Volume V, Parent Manual. Norristown, Pa.: Montgomery County Intermediate Unit, 1975.

Burger, Robert M., Buckley, Sheila M., Mann, Lester, & Baird, Barbara. Training for Independence, Volume IV, Grooming and Self-Care Skills. Norristown, Pa.: Montgomery County Intermediate Unit, 1975.

Coombe, Edmund J., Burger, Robert M., Mann, Lester, Rintamaki, Marilyn, Diamond, Linda, Schiffman, Sedra, Matilsky, Philip, Weiner, Rhoda, & Biacchi, Anthony. Training for Independence, Volume VII, Prevocational/Home Skills. Norristown, Pa.: Montgomery County Intermediate Unit, 1976.

Diamond, Linda, Matilsky, Philip, Burger, Robert M., Mann, Lester, Rintamaki, Marilyn, Weiner, Rhoda, Buckley, Sheila, & Baird, Barbara. Training for Independence, Volume VI, Academics. Norristown, Pa.: Montgomery County Intermediate Unit, 1976.

Doyle, Phyllis B., Mann, Lester, Boardman, Peter, Fanata, Jennifer, Fennelly, Paula, Grotsky, Jeffery N., Proger, Barton B., Schiffman, Sedra, Waltman, Judith, Wagner, Paul, & Weiner, Rhoda. TRAC Monitoring System: Training Resources Acquisition and Control. Norristown, Pa.: Montgomery County Intermediate Unit, 1976.

Mann, Lester, Burger, Robert M., Buckley, Sheila M., & Hickade, Marian L. Training for Independence, Volume I, Underwear and Footwear. Norristown, Pa.: Montgomery County Intermediate Unit, 1975.

Mann, Lester, Proger, Barton B., Cross, Lawrence H., Ewell, Kathleen S., Redelheim, Paul S., & Kalapos, Robert L. Curriculum Management System. New York: Harcourt, Brace, Jovanovich, 1975.

Olsen, K. R. The NLRC diagnostic-prescriptive model (December, 1973). In K. R. Olsen, M. A. Carricato, & CCSU. Special education resources, location, analysis, & retrieval system (SER-LARS), 1974-1975: User's handbook. Harrisburg, Pa.: National Learning Resource Center of Pennsylvania, 1975.

Olsen, K. R., Carricato, M. A., & Central Coordination and Support Unit Staff (CCSU). Special education resources, location, analysis, & retrieval system (SER-LARS), 1975-1976. Harrisburg, Pa.: National Learning Resource Center of Pennsylvania, 1975.

Proger, Barton B., & Mann, Lester. Criterion-referenced measurement: The world of the gray versus black and white. Journal of Learning Disabilities, 1973, 6, 72-84.

Proger, Barton B., Mann, Lester, Burger, Robert M., & Cross, Lawrence H. Adapting criterion-referenced measurement to individualization of instruction for handicapped children: Some issues and a first attempt. Paper presented at the 1972 Annual Convention of the American Educational Research Association, Chicago, Ill., March, 1972. (Available as ERIC Document No. ED 064 354).

Right to Education Office. COMPET: Commonwealth Plan to Educate and Train Mentally Retarded Children. Harrisburg, Pa.: Right to Education Office, Pennsylvania Department of Education, 1972.

White, R. T. Research into learning hierarchies. Review of Educational Research, 1973, 43, 361-375.